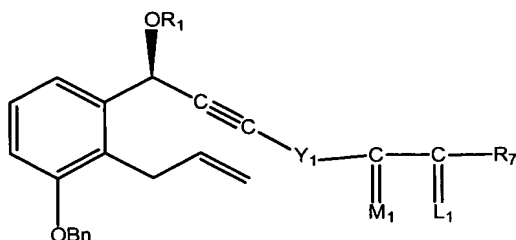
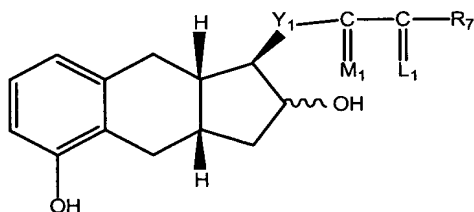


What is claimed is:

1. A process for making 9-deoxy-PGF₁-type compounds comprising cyclizing a starting compound of the formula:



into a compound of the following formula:



wherein Y₁ is trans-CH=CH-, cis-CH=CH-, -CH₂(CH₂)_m-, or -C≡C-; m is 1, 2, or 3;

wherein R₁ is H or an alcohol protecting group;

wherein R₇ is

- (1) -C_pH_{2p}-CH₃, wherein p is an integer from 1 to 5, inclusive,
- (2) phenoxy optionally substituted by one, two or three chloro, fluoro, trifluoromethyl, (C₁-C₃)alkyl, or (C₁-C₃)alkoxy, with the proviso that not more than two substituents are other than alkyl, with the proviso that R₇ is phenoxy or substituted phenoxy, only when R₃ and R₄ are hydrogen or methyl, being the same or different,
- (3) phenyl, benzyl, phenylethyl, or phenylpropyl optionally substituted on the aromatic ring by one, two or three chloro, fluoro, trifluoromethyl, (C₁-C₃)alkyl, or (C₁-C₃)alkoxy, with the proviso that not more than two substituents are other than alkyl,
- (4) cis-CH=CH-CH₂-CH₃,
- (5) -(CH₂)₂-CH(OH)-CH₃, or
- (6) -(CH₂)₃-CH=C(CH₃)₂;

wherein $-C(L_1)-R_7$ taken together is

- (1) (C₄-C₇)cycloalkyl optionally substituted by 1 to 3 (C₁-C₅) alkyl;
- (2) 2-(2-furyl)ethyl,
- (3) 2-(3-thienyl)ethoxy, or
- (4) 3-thienyloxymethyl;

wherein M_1 is $\alpha-OH:\beta-R_5$ or $\alpha-R_5:\beta-OH$ or $\alpha-OR_1:\beta-R_5$ or $\alpha-R_5:\beta-OR_1$, wherein R_5 is hydrogen or methyl and R_1 is an alcohol protecting group; and

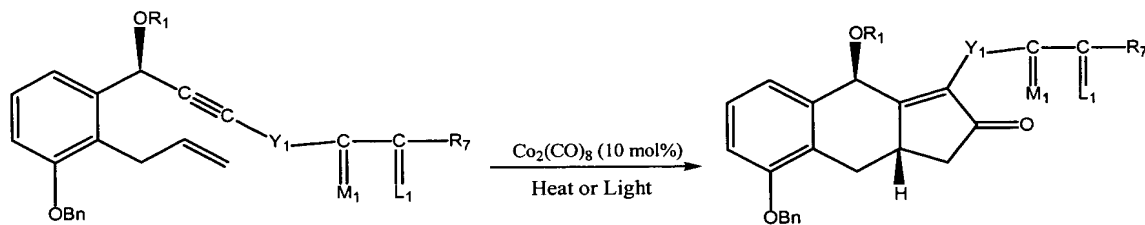
wherein L_1 is $\alpha-R_3:\beta-R_4$, $\alpha-R_4:\beta-R_3$, or a mixture of $\alpha-R_3:\beta-R_4$ and $\alpha-R_4:\beta-R_3$, wherein R_3 and R_4 are hydrogen, methyl, or fluoro, being the same or different, with the proviso that one of R_3 and R_4 is fluoro only when the other is hydrogen or fluoro.

2. The process as claimed in claim 1, wherein the cyclization is a cobalt-mediated cyclization.

3. The process as claimed in claim 2, wherein the starting compound is reacted with $Co_2(CO)_8$ in a non-reactive solvent to form a complex.

4. The process as claimed in claim 3, wherein the non-reactive solvent during the complex-forming step is 1,2-DME.

5. A stereoselective process of making a 9-deoxy-PGF₁-type compound, comprising the following reaction:



wherein R_1 is an alcohol protecting group;

wherein n is 0, 1, 2, or 3;

wherein Y_1 is trans-CH=CH-, cis-CH=CH-, $-CH_2(CH_2)_m-$, or $-C\equiv C-$; m is 1, 2, or 3;

wherein R_7 is

- (1) $-C_pH_{2p}-CH_3$, wherein p is an integer from 1 to 5, inclusive,

(2) phenoxy optionally substituted by one, two or three chloro, fluoro, trifluoromethyl, (C₁-C₃)alkyl, or (C₁-C₃)alkoxy, with the proviso that not more than two substituents are other than alkyl, with the proviso that R₇ is phenoxy or substituted phenoxy, only when R₃ and R₄ are hydrogen or methyl, being the same or different,

(3) phenyl, benzyl, phenylethyl, or phenylpropyl optionally substituted on the aromatic ring by one, two or three chloro, fluoro, trifluoromethyl, (C₁-C₃)alkyl, or (C₁-C₃)alkoxy, with the proviso that not more than two substituents are other than alkyl,

(4) cis-CH=CH-CH₂-CH₃,

(5) -(CH₂)₂-CH(OH)-CH₃, or

(6) -(CH₂)₃-CH=C(CH₃)₂;

wherein -C(L₁)-R₇ taken together is

(1) (C₄-C₇)cycloalkyl optionally substituted by 1 to 3 (C₁-C₅) alkyl;

(2) 2-(2-furyl)ethyl,

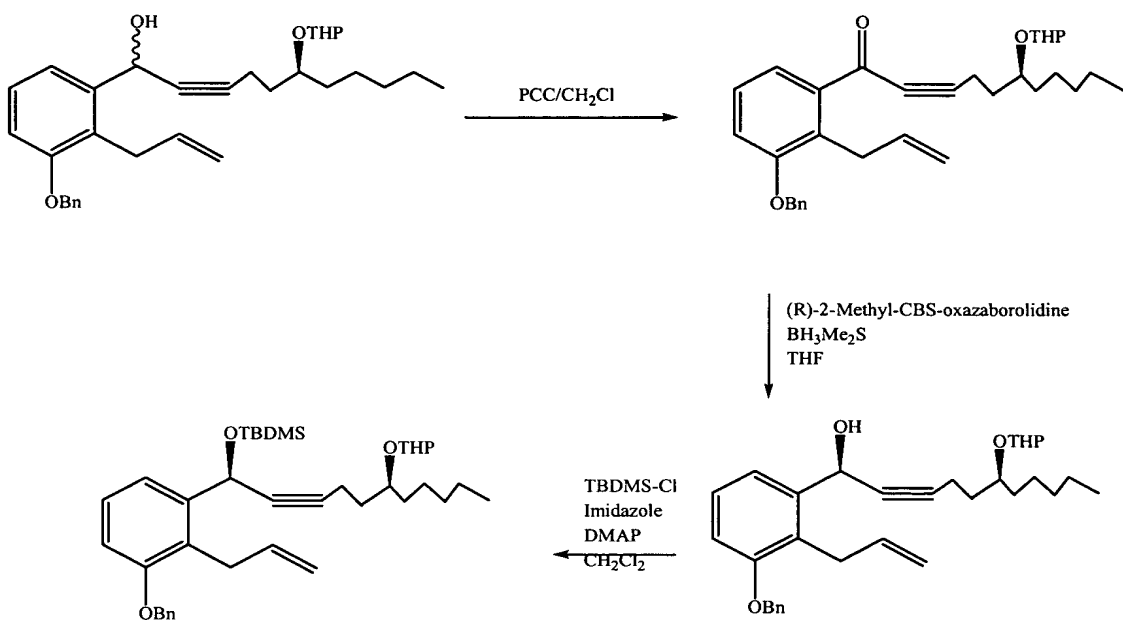
(3) 2-(3-thienyl)ethoxy, or

(4) 3-thienyloxymethyl;

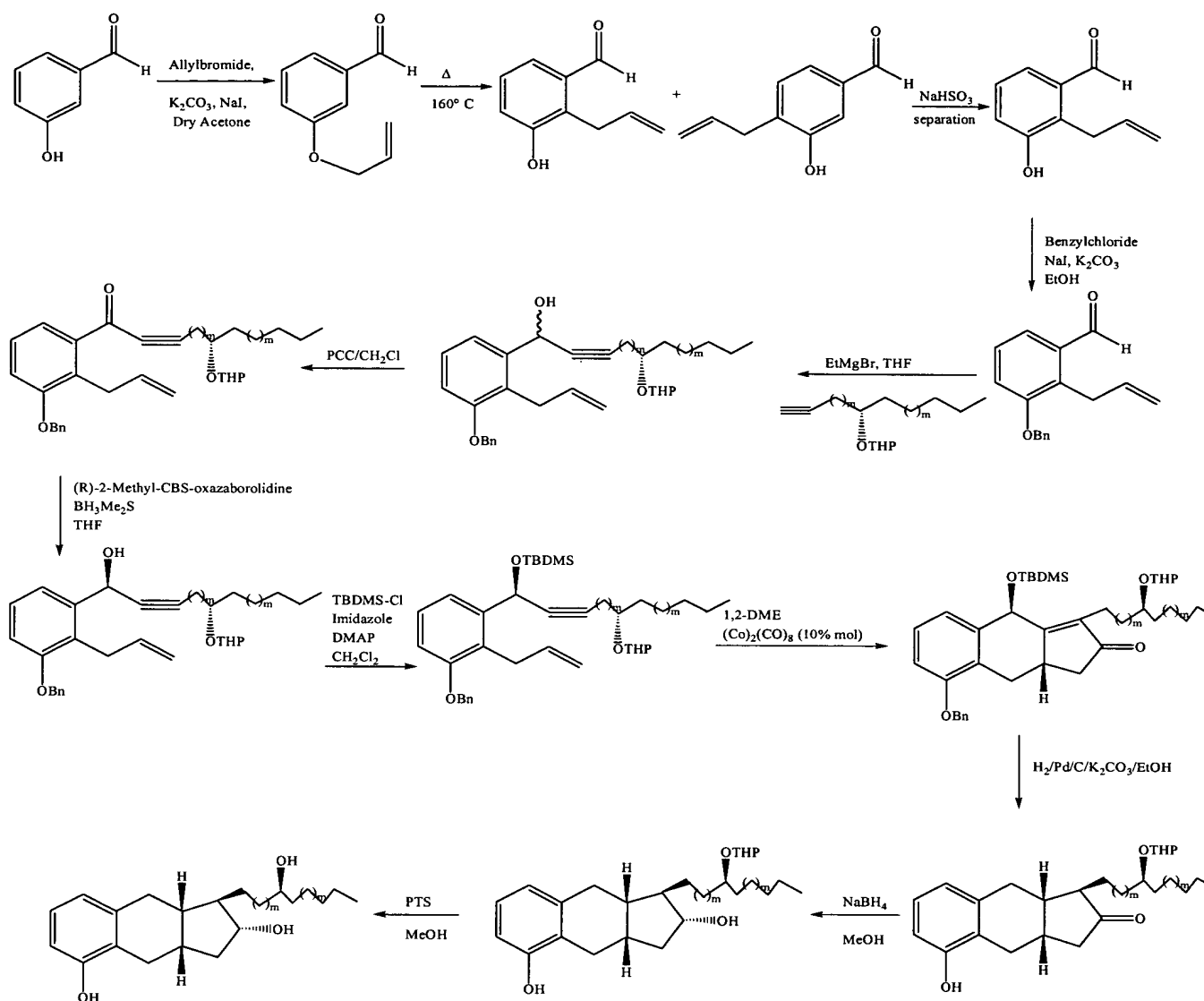
wherein M₁ is α-OH:β-R₅ or α-R₅:β-OH or α-OR₁:β-R₅ or α-R₅: β-OR₁, wherein R₅ is hydrogen or methyl and R₁ is an alcohol protecting group;

wherein L₁ is α-R₃:β-R₄, α-R₄:β-R₃, or a mixture of α-R₃:β-R₄ and α-R₄:β-R₃, wherein R₃ and R₄ are hydrogen, methyl, or fluoro, being the same or different, with the proviso that one of R₃ and R₄ is fluoro only when the other is hydrogen or fluoro.

6. The process as claimed in claim 1, further comprising the following steps:



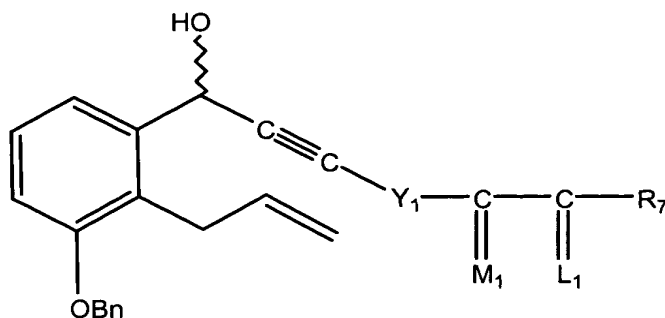
7. The process as claimed in claim 6, comprising the following steps:



wherein m is 1, 2, or 3.

8. The process as claimed in claim 7, wherein m is 1.

9. A compound of the formula:



wherein Y_1 is trans-CH=CH-, cis-CH=CH-, $-\text{CH}_2(\text{CH}_2)_m-$, or $-\text{C}\equiv\text{C}-$; m is 1, 2, or 3;

wherein R_7 is

- (1) $-\text{C}_p\text{H}_{2p}-\text{CH}_3$, wherein p is an integer from 1 to 5, inclusive,
- (2) phenoxy optionally substituted by one, two or three chloro, fluoro, trifluoromethyl, (C_1-C_3) alkyl, or (C_1-C_3) alkoxy, with the proviso that not more than two substituents are other than alkyl, with the proviso that R_7 is phenoxy or substituted phenoxy, only when R_3 and R_4 are hydrogen or methyl, being the same or different,
- (3) phenyl, benzyl, phenylethyl, or phenylpropyl optionally substituted on the aromatic ring by one, two or three chloro, fluoro, trifluoromethyl, (C_1-C_3) alkyl, or (C_1-C_3) alkoxy, with the proviso that not more than two substituents are other than alkyl,
- (4) cis-CH=CH-CH₂-CH₃,
- (5) $-(\text{CH}_2)_2-\text{CH}(\text{OH})-\text{CH}_3$, or
- (6) $-(\text{CH}_2)_3-\text{CH}=\text{C}(\text{CH}_3)_2$;

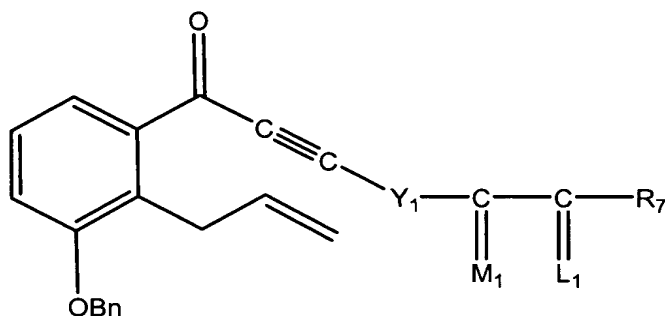
wherein $-\text{C}(\text{L}_1)-\text{R}_7$ taken together is

- (1) (C_4-C_7) cycloalkyl optionally substituted by 1 to 3 (C_1-C_3) alkyl;
- (2) 2-(2-furyl)ethyl,
- (3) 2-(3-thienyl)ethoxy, or
- (4) 3-thienyloxymethyl;

wherein M_1 is $\alpha\text{-OH}:\beta\text{-R}_5$ or $\alpha\text{-R}_5:\beta\text{-OH}$ or $\alpha\text{-OR}_1:\beta\text{-R}_5$ or $\alpha\text{-R}_5:\beta\text{-OR}_1$, wherein R_5 is hydrogen or methyl and R_1 is an alcohol protecting group;

wherein L_1 is $\alpha\text{-R}_3:\beta\text{-R}_4$, $\alpha\text{-R}_4:\beta\text{-R}_3$, or a mixture of $\alpha\text{-R}_3:\beta\text{-R}_4$ and $\alpha\text{-R}_4:\beta\text{-R}_3$, wherein R_3 and R_4 are hydrogen, methyl, or fluoro, being the same or different, with the proviso that one of R_3 and R_4 is fluoro only when the other is hydrogen or fluoro.

10. A compound of the formula:



wherein Y_1 is trans-CH=CH- , cis-CH=CH- , $-\text{CH}_2(\text{CH}_2)_m-$, or $-\text{C}\equiv\text{C-}$; m is 1, 2, or 3;

wherein R_7 is

- (1) $-\text{C}_p\text{H}_{2p}-\text{CH}_3$, wherein p is an integer from 1 to 5, inclusive,
- (2) phenoxy optionally substituted by one, two or three chloro, fluoro, trifluoromethyl, $(\text{C}_1\text{-C}_3)\text{alkyl}$, or $(\text{C}_1\text{-C}_3)\text{alkoxy}$, with the proviso that not more than two substituents are other than alkyl, with the proviso that R_7 is phenoxy or substituted phenoxy, only when R_3 and R_4 are hydrogen or methyl, being the same or different,
- (3) phenyl, benzyl, phenylethyl, or phenylpropyl optionally substituted on the aromatic ring by one, two or three chloro, fluoro, trifluoromethyl, $(\text{C}_1\text{-C}_3)\text{alkyl}$, or $(\text{C}_1\text{-C}_3)\text{alkoxy}$, with the proviso that not more than two substituents are other than alkyl,
- (4) $\text{cis-CH=CH-CH}_2\text{-CH}_3$,
- (5) $-(\text{CH}_2)_2\text{-CH(OH)-CH}_3$, or
- (6) $-(\text{CH}_2)_3\text{-CH=C(CH}_3)_2$;

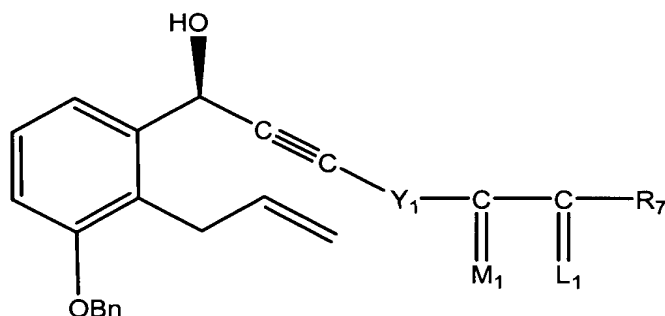
wherein $-\text{C}(\text{L}_1)\text{-R}_7$ taken together is

- (1) $(\text{C}_4\text{-C}_7)\text{cycloalkyl}$ optionally substituted by 1 to 3 $(\text{C}_1\text{-C}_5)\text{ alkyl}$;
- (2) 2-(2-furyl)ethyl,
- (3) 2-(3-thienyl)ethoxy, or
- (4) 3-thienyloxymethyl;

wherein M_1 is $\alpha\text{-OH}:\beta\text{-R}_5$ or $\alpha\text{-R}_5:\beta\text{-OH}$ or $\alpha\text{-OR}_1:\beta\text{-R}_5$ or $\alpha\text{-R}_5:\beta\text{-OR}_1$, wherein R_5 is hydrogen or methyl and R_1 is an alcohol protecting group;

wherein L_1 is $\alpha\text{-R}_3:\beta\text{-R}_4$, $\alpha\text{-R}_4:\beta\text{-R}_3$, or a mixture of $\alpha\text{-R}_3:\beta\text{-R}_4$ and $\alpha\text{-R}_4:\beta\text{-R}_3$, wherein R_3 and R_4 are hydrogen, methyl, or fluoro, being the same or different, with the proviso that one of R_3 and R_4 is fluoro only when the other is hydrogen or fluoro.

11. A compound of the formula



wherein Y_1 is trans-CH=CH-, cis-CH=CH-, $-\text{CH}_2(\text{CH}_2)_m-$, or $-\text{C}\equiv\text{C}-$; m is 1, 2, or 3;

wherein R_7 is

- (1) $-\text{C}_p\text{H}_{2p}-\text{CH}_3$, wherein p is an integer from 1 to 5, inclusive,
- (2) phenoxy optionally substituted by one, two or three chloro, fluoro, trifluoromethyl, (C_1-C_3) alkyl, or (C_1-C_3) alkoxy, with the proviso that not more than two substituents are other than alkyl, with the proviso that R_7 is phenoxy or substituted phenoxy, only when R_3 and R_4 are hydrogen or methyl, being the same or different,
- (3) phenyl, benzyl, phenylethyl, or phenylpropyl optionally substituted on the aromatic ring by one, two or three chloro, fluoro, trifluoromethyl, (C_1-C_3) alkyl, or (C_1-C_3) alkoxy, with the proviso that not more than two substituents are other than alkyl,
- (4) cis-CH=CH-CH₂-CH₃,
- (5) $-(\text{CH}_2)_2-\text{CH}(\text{OH})-\text{CH}_3$, or
- (6) $-(\text{CH}_2)_3-\text{CH}=\text{C}(\text{CH}_3)_2$;

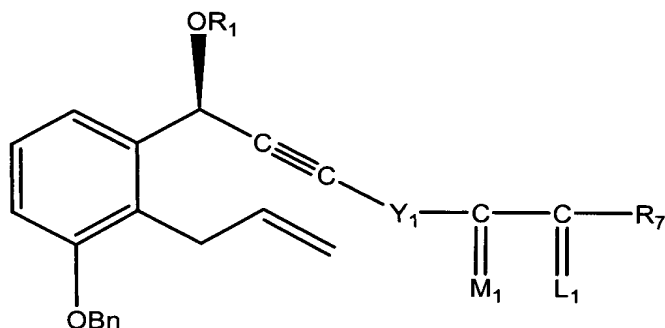
wherein $-\text{C}(\text{L}_1)-\text{R}_7$ taken together is

- (1) (C_4-C_7) cycloalkyl optionally substituted by 1 to 3 (C_1-C_3) alkyl;
- (2) 2-(2-furyl)ethyl,
- (3) 2-(3-thienyl)ethoxy, or
- (4) 3-thienyloxymethyl;

wherein M_1 is $\alpha\text{-OH}:\beta\text{-R}_5$ or $\alpha\text{-R}_5:\beta\text{-OH}$ or $\alpha\text{-OR}_1:\beta\text{-R}_5$ or $\alpha\text{-R}_5:\beta\text{-OR}_1$, wherein R_5 is hydrogen or methyl and R_1 is an alcohol protecting group;

wherein L_1 is $\alpha\text{-R}_3\text{:}\beta\text{-R}_4$, $\alpha\text{-R}_4\text{:}\beta\text{-R}_3$, or a mixture of $\alpha\text{-R}_3\text{:}\beta\text{-R}_4$ and $\alpha\text{-R}_4\text{:}\beta\text{-R}_3$, wherein R_3 and R_4 are hydrogen, methyl, or fluoro, being the same or different, with the proviso that one of R_3 and R_4 is fluoro only when the other is hydrogen or fluoro.

12. A compound of the formula



wherein R_1 is an alcohol protecting group;

wherein Y_1 is trans-CH=CH- , cis-CH=CH- , $-\text{CH}_2(\text{CH}_2)_m-$, or $-\text{C}\equiv\text{C-}$; m is 1, 2, or 3;

wherein R_7 is

- (1) $-\text{C}_p\text{H}_{2p}-\text{CH}_3$, wherein p is an integer from 1 to 5, inclusive,
- (2) phenoxy optionally substituted by one, two or three chloro, fluoro, trifluoromethyl, $(\text{C}_1\text{-C}_3)\text{alkyl}$, or $(\text{C}_1\text{-C}_3)\text{alkoxy}$, with the proviso that not more than two substituents are other than alkyl, with the proviso that R_7 is phenoxy or substituted phenoxy, only when R_3 and R_4 are hydrogen or methyl, being the same or different,
- (3) phenyl, benzyl, phenylethyl, or phenylpropyl optionally substituted on the aromatic ring by one, two or three chloro, fluoro, trifluoromethyl, $(\text{C}_1\text{-C}_3)\text{alkyl}$, or $(\text{C}_1\text{-C}_3)\text{alkoxy}$, with the proviso that not more than two substituents are other than alkyl,
- (4) $\text{cis-CH=CH-CH}_2\text{-CH}_3$,
- (5) $-(\text{CH}_2)_2\text{-CH(OH)-CH}_3$, or
- (6) $-(\text{CH}_2)_3\text{-CH=C(CH}_3)_2$;

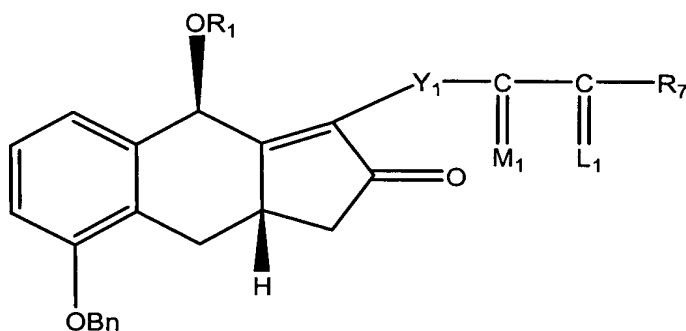
wherein $-\text{C(L}_1\text{)-R}_7$ taken together is

- (1) $(\text{C}_4\text{-C}_7)\text{cycloalkyl}$ optionally substituted by 1 to 3 $(\text{C}_1\text{-C}_5)\text{ alkyl}$;
- (2) 2-(2-furyl)ethyl,
- (3) 2-(3-thienyl)ethoxy, or
- (4) 3-thienyloxymethyl;

wherein M_1 is α -OH: β - R_5 or α - R_5 : β -OH or α -OR₁: β - R_5 or α - R_5 : β -OR₁, wherein R_5 is hydrogen or methyl and R_1 is an alcohol protecting group;

wherein L_1 is α - R_3 : β - R_4 , α - R_4 : β - R_3 , or a mixture of α - R_3 : β - R_4 and α - R_4 : β - R_3 , wherein R_3 and R_4 are hydrogen, methyl, or fluoro, being the same or different, with the proviso that one of R_3 and R_4 is fluoro only when the other is hydrogen or fluoro.

13. A compound of the formula



wherein R_1 is an alcohol protecting group;

wherein Y_1 is trans-CH=CH-, cis-CH=CH-, -CH₂(CH₂)_m-, or -C≡C-; m is 1, 2, or 3;

wherein R_7 is

- (1) -C_pH_{2p}-CH₃, wherein p is an integer from 1 to 5, inclusive,
- (2) phenoxy optionally substituted by one, two or three chloro, fluoro, trifluoromethyl, (C₁-C₃)alkyl, or (C₁-C₃)alkoxy, with the proviso that not more than two substituents are other than alkyl, with the proviso that R_7 is phenoxy or substituted phenoxy, only when R_3 and R_4 are hydrogen or methyl, being the same or different,
- (3) phenyl, benzyl, phenylethyl, or phenylpropyl optionally substituted on the aromatic ring by one, two or three chloro, fluoro, trifluoromethyl, (C₁-C₃)alkyl, or (C₁-C₃)alkoxy, with the proviso that not more than two substituents are other than alkyl,
- (4) cis-CH=CH-CH₂-CH₃,
- (5) -(CH₂)₂-CH(OH)-CH₃, or
- (6) -(CH₂)₃-CH=C(CH₃)₂;

wherein -C(L₁)- R_7 taken together is

- (1) (C₄-C₇)cycloalkyl optionally substituted by 1 to 3 (C₁-C₅) alkyl;
- (2) 2-(2-furyl)ethyl,

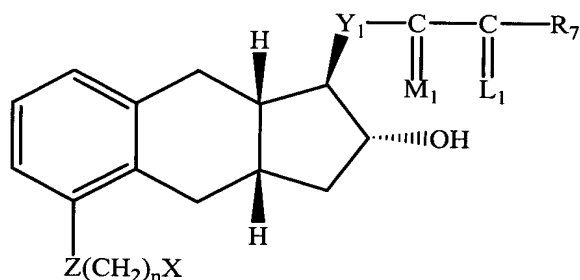
(3) 2-(3-thienyl)ethoxy, or

(4) 3-thienyloxymethyl;

wherein M_1 is $\alpha\text{-OH}:\beta\text{-R}_5$ or $\alpha\text{-R}_5:\beta\text{-OH}$ or $\alpha\text{-OR}_1:\beta\text{-R}_5$ or $\alpha\text{-R}_5:\beta\text{-OR}_1$, wherein R_5 is hydrogen or methyl and R_1 is an alcohol protecting group;

wherein L_1 is $\alpha\text{-R}_3:\beta\text{-R}_4$, $\alpha\text{-R}_4:\beta\text{-R}_3$, or a mixture of $\alpha\text{-R}_3:\beta\text{-R}_4$ and $\alpha\text{-R}_4:\beta\text{-R}_3$, wherein R_3 and R_4 are hydrogen, methyl, or fluoro, being the same or different, with the proviso that one of R_3 and R_4 is fluoro only when the other is hydrogen or fluoro.

14. A stereoselectively produced isomeric compound according to the following formula:



wherein Z , X , Y_1 , M_1 , L_1 , R_7 and n are as defined in claim 1 and said compound is produced according to the stereoselective synthesis of claim 1.

15. The stereoselectively produced isomeric compound of claim 14, wherein Z is O , n is 1, X is COOH , Y_1 is $-\text{CH}_2\text{CH}_2-$, M_1 is $\alpha\text{-OH}:\beta\text{-R}_5$, wherein R_5 is hydrogen, L_1 is $\alpha\text{-R}_3:\beta\text{-R}_4$, wherein R_3 and R_4 are hydrogen and R_7 is propyl.

16. The stereoselectively produced compounds of claim 14, which are produced as pure diastereomers.